

# Introduction

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## Basic Information

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- **Soft Machine Vision**
- Smart Factory Innovation Club of Zhejiang University
- Class locations: 紫金港月牙楼301
- Class time: Sunday 9:30 to 11:30
- Number of students enrolled: 42

## Course Outline

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- Image basics: Pixels, Colors, Image formats
- Image processing techniques: Filtering, Binarization, cutting, Morphological transformation, Scale and rotation transformation, Image gradient
- Image pattern recognition: Line and circle detection, Feature point detection, Edge detection
- Image pattern recognition: Blob detection, Feature point detection, Template matching
- Neural network basics: Neuron structure, Multi-layer Perceptron, Handwritten digit recognition, Loss function
- Neural Network Basics: Gradient Descent, Backpropagation
- Neural network basics: Softmax regression, Deep neural network, Convolutional Neural Network
- Neural Network Basics: Recurrent Neural Networks, Attention Mechanism & Transformer, Natural Language Processing, Reinforcement Learning, Generative Adversarial Networks, Server Resources
- Final project and Q&A: Chess board recognition system

## Configuration

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- Python3.9.9 [link](#)
- Remember to add Python to `PATH` and environment variables

```
PS C:\Users\87236> F:\Python399\python.exe
Python 3.9.9 (tags/v3.9.9:ccb0e6a, Nov 15 2021, 18:08:50) [MSC v.1929 64 bit
(AMD64)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>> exit()
```

- Install required packages
  - `python.exe -m pip install -r .\0-introduction\requirements.txt`

- VS Code [link](#) (optional)
  - Config python3.9.9 in your vscode

## Test configuration

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- `python.exe .\0-introduction\show_a_cat.py`
- Press `Esc` or `q` on the keyboard to close the window

```
import sys

print(sys.version)
```

```
3.9.9 (tags/v3.9.9:ccb0e6a, Nov 15 2021, 18:08:50) [MSC v.1929 64 bit (AMD64)]
```

```
import cv2
import numpy as np
import matplotlib.colors as mat_color

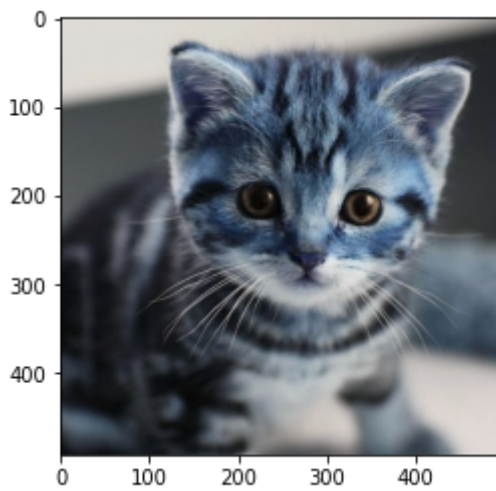
print(cv2.__version__)
path = "./images/cat.jpg"
img_bgr = cv2.imread(path)
no_norm = mat_color.Normalize(vmin=0, vmax=255, clip=False)
print(type(img_bgr))
print(np.shape(img_bgr))
```

```
4.5.5
<class 'numpy.ndarray'>
(493, 493, 3)
```

```
from matplotlib import pyplot as plt

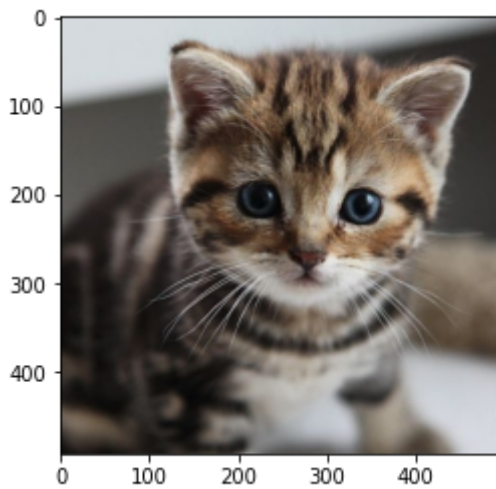
plt.imshow(img_bgr, norm=no_norm)
```

```
<matplotlib.image.AxesImage at 0x1a07e4b1580>
```



```
img_rgb = cv2.cvtColor(img_bgr, cv2.COLOR_BGR2RGB)  
plt.imshow(img_rgb, norm=no_norm)
```

<matplotlib.image.AxesImage at 0x1a07e5a2d60>



```
import os

os.makedirs('data', exist_ok=True)
data_file = os.path.join('data', 'cat.csv')
print(data_file)
with open(data_file, 'w') as f:
    f.write('R,G,B\n')
    for row in img_rgb:
        for rgb in row:
            f.write(str(rgb[0]) + ',' + str(rgb[1]) + ',' + str(rgb[2]) + '\n')
```

data\cat.csv

## The End

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